



Plush Irradiated Sirloin

Written By: Becky Stern



TOOLS:

- [Arduino IDE software \(1\)](#)
- [Computer \(1\)](#)
- [Hot glue gun \(1\)](#)
- [Iron \(1\)](#)
- [Ironing board \(1\)](#)
- [Pliers \(1\)](#)
- [Sewing machine \(1\)](#)
- [Sewing needle \(1\)](#)
- [Sewing pins \(1\)](#)
- [Soldering iron \(1\)](#)
- [USB A-B cable \(1\)](#)
- [Wire cutters \(1\)](#)



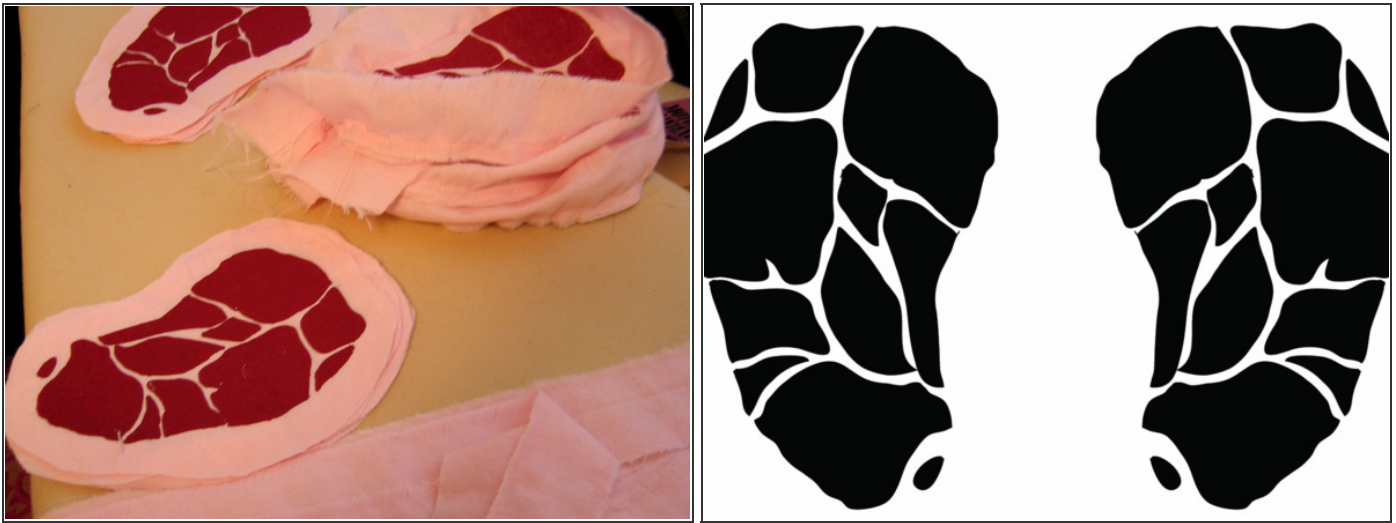
PARTS:

- [360° LEDs \(16\)](#)
- [Transistor \(2\)](#)
- [Solderless breadboard \(1\)](#)
and/or solder-type breadboard
- [Solder \(1\)](#)
- [Fabric \(1\)](#)
or silk-screen your own
- [Thread \(1\)](#)
- [Polyester fiberfill \(1\)](#)
plush stuffing
- [Arduino microcontroller \(1\)](#)
- [AC adapter \(1\)](#)
- [Toggle switch \(1\)](#)
optional
- [Epoxy \(1\)](#)
or hot glue
- [Hook-up wire \(1\)](#)

SUMMARY

Faced with an assignment to make a plush night light, I thought, “Why light?” and brainstormed reasons for a stuffed toy to light up. In a glowworm toy, for instance, the light mimics nature. I’d been reading Michael Pollan’s *The Omnivore’s Dilemma*, and this got me thinking about the chain of refrigeration, labor, and irradiation involved in American beef production. So I thought, glowing irradiated meat! I know that irradiated meat doesn’t glow, and neither does toxic waste unless it’s in a cartoon, but plush toys typically represent cartoon characters anyway, so it made sense: Plush Irradiated Sirloin.

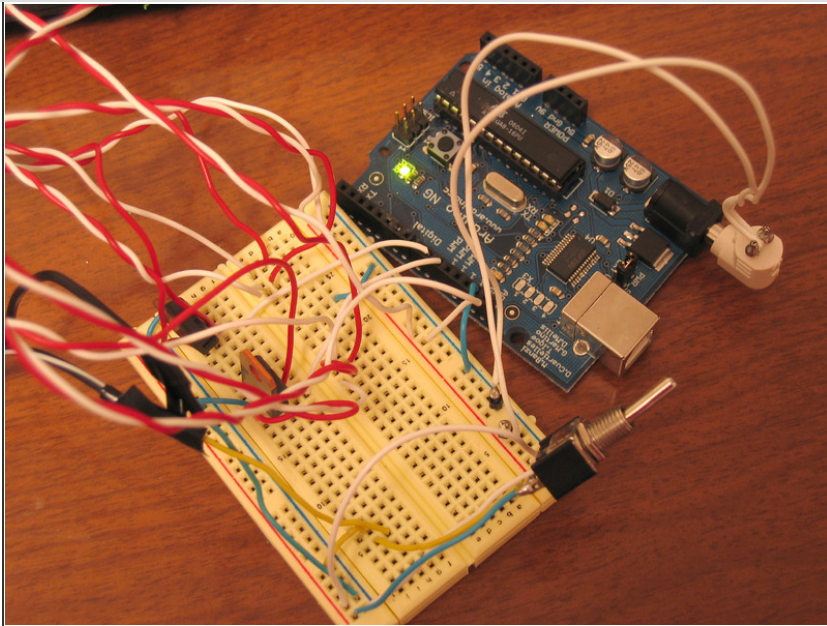
Step 1 — Prepare the fabric.



- I silk-screened my steak illustration onto pink flannel and sewed the pieces together (inside out, so the seams wouldn’t show), leaving a small opening at the base of each one. (For an excellent primer on silk-screening, check out CRAFT magazine, Volume 01, page 106.) You can also use pre-patterned fabric or use fabric paint to hand-paint the design. Next, I turned them right side out, but left them empty. I had to put the lights inside before I stuffed the plush fiberfill around them!
- Grab the silkscreen template: http://makezine.com/11/diyhome_steam/

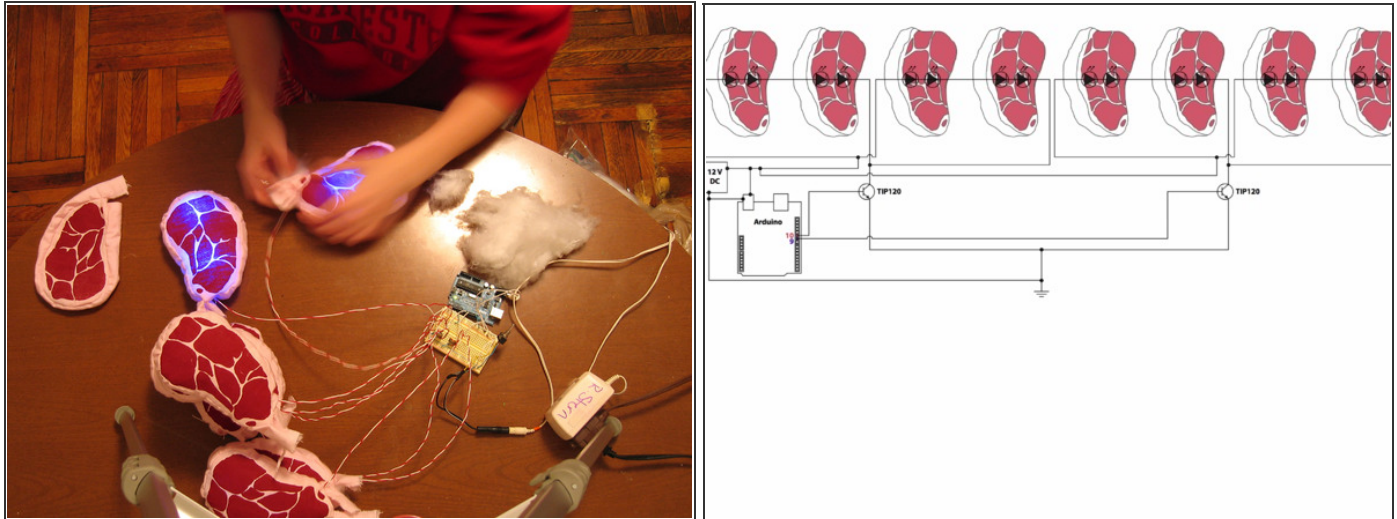


Step 2 — Add the Arduino board.



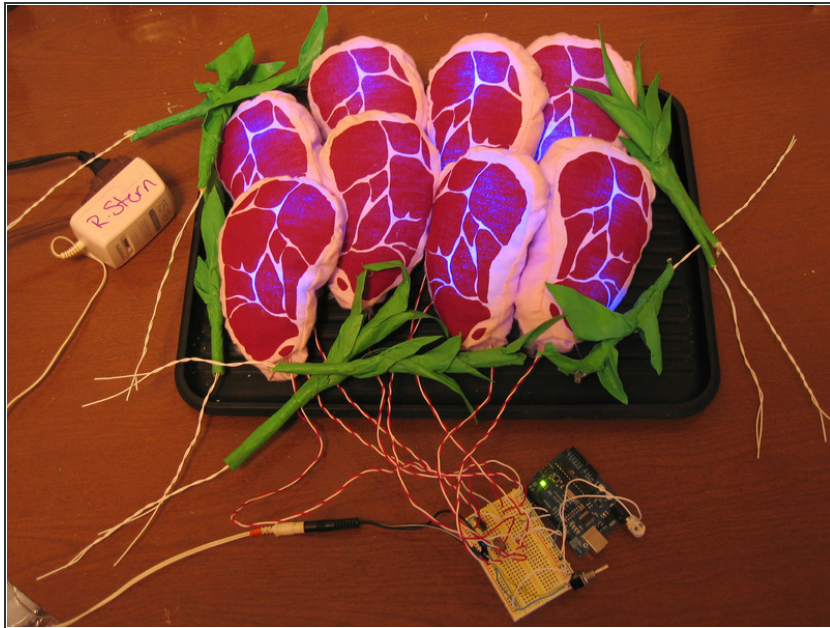
- Grab the code:
http://makezine.com/11/diyhome_steak/
- Inside, each steak has two 360° super-bright LEDs wired in series. These have frosted lenses that distribute the light evenly in all directions, making them perfect for the inside of plush toys. Because I wanted the steaks to glow dimmer and brighter periodically, I needed some kind of signal to control the brightness of the lights. The Arduino board, my favorite microcontroller solution lately, supports the perfect feature for this: pulse width modulation (PWM). PWM can make LEDs, which are binary, appear dimmer by pulsing them on and off, with varying time ratios, faster than the human eye can see.
- The PWM signal controls the glow, but the Arduino can only output up to 5V, which isn't high enough to power these super-bright LEDs. I had planned to power the Arduino with a 12V AC adapter, so I designed the circuit to drive the LEDs from the same source. I used 2 TIP 120 transistors to amplify the signal to each half of the meat tray, 4 steaks each. This pumps the circuit's full 12V through 2 parallel sets of 2 LEDs (2 steaks, 4 LEDs) in series, which works out to 3V per LED.

Step 3 — Add the LEDs



- For each steak, I made an LED insert with 2 LEDs wired in series and neatly twisted. I spaced the LEDs about 4" apart, so that they would each light up an even half of the steak without being too close to the edges. I made the lead wires really long, and I knew they would be exposed, so I chose red and white wire to match my plush.
- After wiring up the circuit and soldering and testing the LEDs, I finally assembled the steaks. It's important to make sure all your LEDs are functioning properly first; it's no fun to debug a sewn-together toy. Since electronics with fabrics could be a fire hazard, I covered the LED leads in epoxy (hot glue works, too) to prevent a potentially dangerous short.
- I positioned each double-LED wire inside a steak, and filled around it with polyester filling. I left the LEDs plugged in, so I could see how the light diffused and adjust them accordingly. When I got them how I wanted, I stitched up the bottom openings by hand, and arranged them together on a tray.

Step 4 — Bask in the glow.



- Each half of the tray (4 steaks) glows in alternation with the other. The pattern is subtle and soothing, the way a good nightlight should be. They're soft, but not very cuddly, as they remain tethered to their circuit board. In the future I could embed smaller circuit boards inside each steak to make a portable, more snuggly version. I've also been thinking of making a larger version for throw pillows, or a smaller version with catnip instead of electronics. These steaks have been great conversation starters in the classroom and online, and I hope they inspire people to learn about the politics of our food industry.

This project first appeared in [MAKE Volume 11](#).

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